Claims

1. A metallic copper catalyst for use in an ethylene addition reaction to provide a polyfluoroalkylethyl iodide from a polyfluoroalkyl iodide and ethylene.

2. The metallic copper catalyst according to Claim 1, wherein the polyfluoroalkyl iodide is a compound represented by Formula (I):

$$R_f\text{-}I \qquad (I)$$

wherein R_f is a $C_{1\text{-}6}$ polyfluoroalkyl; and
the polyfluoroalkylethyl iodide is a compound represented by Formula (II):

$$R_f\text{-}CH_2CH_2\text{-}I \qquad (II)$$

wherein R_f is as defined above.

3. A process for producing a polyfluoroalkylethyl iodide represented by Formula (II):

$$R_f\text{-}CH_2CH_2\text{-}I \qquad (II)$$

wherein R_f is a $C_{1\text{-}6}$ polyfluoroalkyl,
the process comprising the step of reacting ethylene with a compound represented by Formula (I):

$$R_f\text{-}I \qquad (I)$$

wherein R_f is as defined above, in the presence of a metallic copper catalyst.

4. The process according to Claim 3, wherein the

metallic copper catalyst is a powdery metallic copper or a metallic copper supported on a carrier, and the reaction is conducted at a temperature of 50-200°C under a pressure of 0.01-3 MPa.

5. A process for producing polyfluoroalkylethyl iodide (IV), the process comprising steps (a) and (b) conducted in the presence of the same metallic copper catalyst:

(a) a step of reacting tetrafluoroethylene with a compound represented by Formula (I):

$$R_f\text{-}I \qquad (I)$$

wherein R_f is a C_{1-6} polyfluoroalkyl, to produce a compound represented by Formula (III):

$$R_f(CF_2CF_2)_nI \qquad (III)$$

wherein n is an integer from 1 to 8 and R_f is as defined above; and

(b) a step of reacting ethylene with compound (III) obtained in step (a) to produce a polyfluoroalkylethyl iodide represented by Formula (IV):

$$R_f(CF_2CF_2)_nCH_2CH_2I \qquad (IV)$$

wherein R_f and n are as defined above.

6. A process for producing polyfluoroalkylethyl acrylate (VI), the process comprising steps (a), (b) and (c), steps (a) and (b) being conducted in the presence of the same metallic copper catalyst:

(a) a step of reacting tetrafluoroethylene with a compound represented by Formula (I):

$$R_f\text{-}I \qquad (I)$$

wherein R_f is a $C_{1\text{-}6}$ polyfluoroalkyl, to produce a compound represented by Formula (III):

$$R_f(CF_2CF_2)_nI \qquad (III)$$

wherein n is an integer from 1 to 8 and R_f is as defined above;

(b) a step of reacting ethylene with compound (III) obtained in step (a) to produce a compound represented by Formula (IV):

$$R_f(CF_2CF_2)_nCH_2CH_2I \qquad (IV)$$

wherein R_f and n are as defined above; and

(c) a step of reacting compound (IV) obtained in step (b) with a carboxylate represented by Formula (V):

$$CH_2=C(X)COOM \qquad (V)$$

wherein X is H or CH_3 and M is an alkali metal, to produce a polyfluoroalkylethyl acrylate represented by Formula (VI):

$$R_f(CF_2CF_2)_nCH_2CH_2OCOC(X)=CH_2 \qquad (VI)$$

wherein R_f, n and X are as defined above.

7. A process for producing a polyfluoroalkylethyl acrylate represented by Formula (VII):

$$R_fCH_2CH_2OCOC(X)=CH_2 \qquad (VII)$$

wherein R_f is a C_{1-6} polyfluoroalkyl, and X is H or CH_3,

the process comprising reacting a polyfluoroalkylethyl iodide obtained according to the production process of Item 3 and represented by Formula (II):

$$R_f-CH_2CH_2-I \qquad (II)$$

wherein R_f is as defined above, with a carboxylate represented by Formula (V):

$$CH_2=C(X)COOM \qquad (V)$$

wherein X is as defined above, and M is an alkali metal.